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A PROTOTYPICAL MODEL FOR ESTIMATING HIGH TECH NAVY RECRUITING MARKETS

by

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A Prototypical Model For Estimating
High Tech Navy Recruiting Markets

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ABSTRACT

This thesis presents a method for identifying and analyzing the recruiting market for highly technical Navy ratings. A basic model estimates the eligibility for six market segments for four mental outcomes, (1) High Tech, (2) High Quality and Not High Tech, (3) mental category 3B and (4) not eligible for the military labor market. A second model estimates the interest in military employment for each market segment given their likelihood of being qualified for the highly technical ratings. The third model is based on the results of the first two models and estimates the actual joining behavior of each market segment of the high tech market given their level of interest in the military.

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I. INTRODUCTION

"The quality of military personnel is at an all-time high. All commanders attribute the success of DESERT STORM to the quality of the people and their training...

The success we had in DESERT STORM speaks to the need for and value of high quality recruits and training."[1]

These statements by the Assistant Secretary of Defense for Force Management and Personnel, Christopher Jehn, highlight three things: first, the war in the Gulf was won by highly qualified and highly trained women and men. Second, further success for the U.S. Armed Forces will depend on effective recruitment policies and training methods. And third, highly trained people have maximum effectiveness when combined with high-tech weapons systems.

Training and recruiting are both major areas of interest for manpower analysts because they determine, in large part, the quality of the Armed Forces. However, those available for training are a subset of all recruits, because not all recruits have the mental achievement required for training. The military services themselves conduct training, whether it is general or specific. The elements of the training, which

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[1] Jehn, Christopher, Assistant Secretary of Defense, Force Management and Personnel, in: Memorandum for the Secretary of Defense, OPERATIONS DESERT SHIELD/STORM, LESSONS LEARNED, unpublished, not numbered, 1991.

provide the structure for military education, are based on decisions inside the military organization. The Department of Defense and its subdepartments adjust their training policies to current conditions and methods in the 'educational training market'.

On the other hand, the recruiting success depends on more than military practices. In fact, recruiting is highly dependent on the civilian labor market. Many factors determine the dimensions of this market and most of them lie outside of military control. Furthermore, military recruiters are forced into competition with other employers. In the next few years, for example, the rivalry between civilian and military employers will become even more intense. Current population demographics show that the workforce of the United States will decline until the mid 1990's. Hence, the number of those eligible to enlist will also decline.[2]

Another factor will worsen this situation: fewer students with high school diplomas will enter the labor force, and it has been predicted that their level of general intellectual achievement will also be lower.[3] The Office of Technology Assessment estimates that 20% to 30% of the workforce is already deficient in the basic skills required to perform

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[2] Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics), America's Volunteers: A report on the All-Volunteer Armed Forces, Washington, D.C. 1978, p. 183.

[3] Johnston, William B., Global Work Force 2000, The New World Labor Market, in: HARVARD BUSINESS REVIEW, Volume 69, No.2, 1991, p. 121.

effectively in the workplace.[4] It is realistic to predict that both aspects will further reduce the prime market for qualified recruits.

From a labor economics perspective, an individual enlists when the military compensation package meets or exceeds his reservation wage.[5] The military itself has little direct influence on this reservation wage, but it can try to allocate its recruiting resources more efficiently. Consequently, a basic military manpower question for the future is whether the military will be able to attract enough people who are qualified for military service and able to handle complex weapon systems?

This thesis attempts to identify the qualified military available (QMA) and qualified military interested (QMI) market for highly specialized ratings. A specified segment of the youth labor market constitutes the pool for QMA. General requirements are age (17 to 21 years old), high school graduation and a score above the 50th percentile on the Armed Forces Qualification Test (AFQT).

The specialized ratings, or 'specialists' are special based on occupational fields defined by the military services and on their associated entry scores on the Armed Services

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[4] Worker Training: Competing in the New International Economy, Office of Technology Assessment, U.S. Congress, Washington, D.C., 1990.

[5] See Goldberg, Lawrence, Enlisted Supply: Past, Present and Future, Center for Naval Analysis, pp 19-21, 1982.

Vocational Aptitude Battery (ASVAB). Econometric QMA and QMI models are estimated for 'specialists'.

The classification of four different types of specialists serves as an operational illustration for the econometric models.

- Type I The Technical Specialist
- Type II The Intelligence Specialist
- Type III The Administrative Specialist
- Type IV Others.

Subsidiary research questions involve the selection of explanatory variables and the specification of the forecasting models.

II. RECRUITING AND ASVAB SCORES

A. REVIEW OF CURRENT RECRUITING POLICIES IN THE SERVICES

In the Department of Defense all four military services use different criteria to select qualified recruits. The Armed Services Vocational Aptitude Battery, or ASVAB, is currently used to screen applicants. The ASVAB contains ten subtests designed to measure the ability of recruits in separate general skill areas. The subtests are listed in Table 1.

TABLE 1
ASVAB TEST FORMAT

SUBTEST	Minutes/ Questions	Description of Subtest Content
1. General Science	11 / 25	Physics and biology.
2. Arithmetic Reasoning	36 / 30	Arithmetic word problems.
3. Word Knowledge	11 / 35	Meaning of words.
4. Paragraph Comprehension	13 / 15	Obtain written inform.
5. Numerical Operations	3 / 50	Arithmetic speedtest.
6. Coding Speed	7 / 84	Speedtest.
7. Auto and Shop Info.	11 / 25	Knowledge about cars.
8. Mathematics Knowledge	24 / 25	High school mathem.
9. Mechanical Comprehension	19 / 25	Mechanical & physical principles.
10. Electronics Information	9 / 20	Electricity & electronics.

Although the Air Force, Army, Marine Corps and Navy use the same ASVAB test for their recruit screening, different numbers of qualified applicants apply to each service which allows the recruiting commands to define different ASVAB composites for their specialist ratings. Furthermore, the services specify the necessary minimum scores for similar occupational fields differently. On the other hand, several composites of the ASVAB with the same title may be composed of different groups of subtests. The mechanical composites for Navy and Air Force are not, for example, constructed in the same way.[6]

A closer look at the way Marine Corps recruiters screen applicants can serve as an example of the assignment of occupational specialty. Marine Corps, like the other services matches jobs with ASVAB test results. The US Marine Corps recruiting and selection policies are presented in the 'Military *Occupational Specialties Manual*' (MOS Manual)[7]. The stated purpose of the handbook is to provide a guide to the identification of recruit skills and to help in matching qualified recruits with the available billets.[8]

ASVAB scores are used to filter the recruits into different occupational fields. There are thirty-seven occupational fields with specific subfunctional areas, each requiring different minimum scores. At present, the Marine

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[6] Eitelberg, Mark, Manpower for Military Occupations, Office of the Assistant Secretary of Defense, Washington, D.C. 1988, p. 71.

[7] Military Occupational Specialties Manual, US Marine Corps, Washington D.C, 1991

[8] Ibid, p. 1.

Corps uses four ASVAB classification composites:[9] CL (Clerical), EL (Electronics Repair), MM (Mechanical Maintenance) and GT (General Technical) [10].

The composites scores determine whether the recruiting commands can offer an applicant a job in the preferred occupational specialty. The composites may also show that the recruit may perform better in a different occupational specialty. As in the other services, the Marine Corps then tries to convince the applicant to sign up for the field to which he is best suited.

B. THEORETICAL IMPLICATIONS OF COMPOSITES AND CUTSCORES

The services use the ASVAB scores to determine individual skill levels in hopes of predicting future performance in the assigned occupational field.[11] The Armed Forces Qualification Test, or AFQT, represents a specific aptitude composite based on four ASVAB subtests:

- word knowledge
- paragraph comprehension

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[9] Army: 9 composites, Air Force: 4 composites, Navy: 10 composites.

[10] Eitelberg, Mark, Manpower for Military Occupations, Alexandria, VA, 1988, p. 70.

[11] However, the Military Career Guide provides applicants with the following information about the ASVAB: "An 80 percent change of qualifying is similar to a weather forecast's prediction of an 80 percent chance of rain. This prediction means that under certain weather conditions, it rains 80 times out of 100." in: MILITARY CAREER GUIDE, U.S. Department of Defense, Washington, D.C. 1985, p. X.

- arithmetic reasoning
- numerical operations.

The military services use other composites for the subtest combination to assess aptitude for specific specialties. These are given in Table 2:

TABLE 2:
ASVAB CLASSIFICATION COMPOSITES BY SERVICE[12]

ARMY	**EL, OF, SC, MM, CL, ST, CO, FA, GM**
MARINE CORPS	**CL, EL, MM, GT**
NAVY	**GT, MECH, ELEC, CLER, BE/E, BT/EN/MM, MR, SUB, CT, HM**
Air FORCE	**M, A, G, E**

These subtests should support some assessment about the individual skills of an applicant. However, as with many tests of this type, critics of the ASVAB argue that racial and gender bias may lead to limitations in the applicability of the test results.[13]

Regardless of the reliability and validity of the ASVAB two additional questions must be evaluated: How can we define

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[12] These are the composites currently used by all four Military Services based on information from the local recruiters. For explanation of the used abbreviations see Appendix C.

[13] For a further discussion of this issue the interested reader is referred to Mark Eitelberg, SUBPOPULATION DIFFERENCES IN PERFORMANCE ON TESTS OF MENTAL ABILITY: HISTORICAL REVIEW AND ANNOTATED BIBLIOGRAPHY, Technical Memorandum 81-3, Directorate for Accession Policy, Office of the Secretary of Defense, Washington, D.C., 1982.

the term specialist? And, how are minimum scores used for identifying the specialist market?

The following explanations will try to answer these questions. Furthermore, they will be used as cornerstones for the later theoretical model. Prototypical classifications of high tech and specialists will be made, because none of the services has an operational definition for high tech occupations.

The term specialist refers to all military occupational fields as long as a certain minimum ASVAB score, the cutscore, which allows only a segment of the recruits to enter certain ratings. The term specialist implies the following connotations in the military: technology, high tech, computer, complex weapon systems, sophisticated structural work, etc. This terminology is part of our operational definition of specialist. For this thesis, specialists are a subset of what is often referred to as 'high quality' recruits. The common definition of a high quality recruit is a high school graduate who scores above the national median on the AFQT.

<u>However</u>, specialists cannot only focus on the narrow scope of technology. There are other occupational fields in the military which demand 'smart' recruits with high ASVAB scores. Translators, intelligence specialists, criminal investigators and the like may work in a less technical environment and yet be more challenged mentally than a rifleman, a decksmate or a commissary meat cutter.

Based on these assumptions we can define four different types of specialists,

- The technical specialist
- The intelligence specialist
- The administrative specialist
- Others.

Questions concerning minimum scores seem like judgements about whether one is smart or not. As a matter of fact, some individuals have better intellectual achievement than others and are therefore more capable of performing certain tasks than others. Statements about such abilities are not necessarily statements about the value of an individual. However, a cutscore is used by the military as an entrance ticket to special occupational fields.

1. Type I: The Technical Specialist[14]

The technical specialist is a person who installs, supervises, maintains, and operates weapon systems and their peripheral equipment. He is characterized by higher scores level in general technical (GT), electronics information (EL), Surveillance/communications(SC), general maintenance (GM) and mechanical maintenance (MM).

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[14] All examples for the classification into four types of specialists are based on Military Occupational Classification Manuals of AIR FORCE, ARMY, MARINE CORPS and NAVY. Where appropriate the OCCUPATIONAL CONVERSION MANUAL, Department of Defense, DMDC, Alexandria, VA 1982 is used.

Examples of the technical specialist occupation are air traffic control radar specialist (AIR FORCE), patriot system repairer (ARMY), AEGIS combat system technician (NAVY), instrument repair specialist (USMC).

2. Type II: The Intelligence Specialist

These specialists manage the collection, processing, and dissemination of intelligence. Their work includes analysis, counterintelligence, imagery interpretation, and translation. In contrast to the technical specialist, the intelligence specialist usually works mainly in a mentally demanding environment in which technology plays only a supporting role. All four services use the services of the intelligence specialists. Special skill levels are required in the general technical(GT), skilled technical(ST) and electronics(EL) subtests. The AIR FORCE, ARMY, and MARINE CORPS employ intelligence specialists; the NAVY calls a similar occupational field ocean surveillance information system (OSIS) analyst.

3. Type III: The Administrative Specialist

An administrative specialist performs clerical and organizational duties such as preparing correspondence, maintaining files and directive systems, and monitoring classified materials. The use of word processors and data storage systems has recently lent a technical aspect to an occupation that previously involved mainly reading, writing and filing. Nowadays, an administrative specialist performs more work in less time with the help of personal computers and personnel management information systems. The major requirement for success as an administrative specialist is a mastery of the English language.

A second aspect of this occupational field is the functional support of the services. Recruiting and counseling, legal and medical work, data processing, accounting, finance and disbursing require the skills of the administrative specialist. The administrative specialist may be a personnel clerk or personnel specialist in the Air Force, Army, Marine Corps and Navy. Except for the Air Force, which uses the score on the Administrative (A) ASVAB composite, all other services use scores on the clerical (CL/CLER) as ASVAB classification composite. For the purpose of this study only jobs requiring above average component scores will be considered.

4. Type IV: Other Specialists

This type of specialist includes all those occupational fields which are not covered by the first three classifications. As part of the study, it will include the proportion of the high quality market which does not require cutscores above 100 in the ASVAB composites. Nevertheless, 'Other Specialists' contains in its typification the notion of high quality, because its definition is defined as "high school graduates scoring above the 50th percentile on the Armed Forces Qualification Test"[15].

C. PURPOSE OF THE CLASSIFICATION

The definition of the four types of specialists is used for the underlying theoretical model to predict the size and interest of the specialist market. The classification and the required ASVAB subtest composites are translated into the numeric arithmetic of the ASVAB. Table 3 shows the different types of specialists and the required composites.

TABLE 3
SPECIALIST CLASSIFICATION

SPECIALIST CLASSIFICATION

TYPE	Classification	REQUIREMENTS
Type I	Techn. Specialist	GT/EL/SC/GM/MM
Type 2	Intell. Specialist	GT/EL/ST
Type 3	Admin. Specialist	A/CL/CLER
Type 4	Others	All Composites

Based on the specialist type, the scores and a NLSY data set an econometric analysis will be conducted in order to investigate this segment of the prime market. A prototypical Navy 'high tech' classification is used as the demonstration case for econometric equations. Moreover, the equations will

[15] Thomas, George W., Gorman, Linda, Estimation of High Quality Military Available and Interested, Draft Technical Report, Naval Postgraduate School, Monterey, CA, 1991, p. I.

be used for any defined type of occupational field. With the help of the model, recruiting commands may be better able to understand the high quality and high tech markets and to assess their relative size over location and time. Changes over time in the design of occupational fields and their assigned billets can be matched with available data about potential high tech QMAs and QMIs.

III. THE NAVY'S CLASSIFICATION SYSTEM AND THE SPECIALIST DEFINITION

The NAVY is the only service which differentiates occupations into the three general categories,

- semitechnical
- technical
- highly technical.

The ratings assigned to the categories indicate that the recruit selection for those occupational fields are based on the subtest scores.[15]

About one third of all enlisted personnel are assigned to the least technical job category (semitechnical).[16] The following table shows ratings for the semitechnical category:

TABLE 4
NAVAL RATINGS AND APTITUDE COMPOSITES FOR THE SEMITECHNICAL CATEGORIES

Semitechnical Job	Aptitude Composites Requirements
Boatswain's Mate (BM)	No Aptitude Composites required
Boiler Technician (BT)	BT > 94 / BT = MK + AS
Ship's Serviceman (SH)	GT > 97 / GT = VE + AR
Signalman (SM)	GT > 104 / GT = VE + AR
Postal Clerk (PC)	GT > 110 / GT = VE + AR

[15] Eitelberg, Mark, Manpower for Military Occupations, Alexandria, VA, 1988, p. 151/p. 159.

[16] Data provided by Department of Defense, Manpower Data Center, East, 4th Floor, 1600 N. Wilson Boulevard, Arlington, VA 22209-2593, letter to Prof. George W. Thomas, 06/30/91.

At the other end of this categorization we find the highly technical jobs. Approximately 20 percent of all enlisted personnel are assigned to jobs of this kind.[17] Qualification standards are positively correlated with the demands of the occupational field.

TABLE 5
HIGHLY TECHNICAL JOB APTITUDE COMPOSITES REQUIREMENTS

Cryptologic Technician (CTI)	CT > 207 // CT = VE+AR+NO+CS
Air Traffic Controller (AC)	BE/E > 210 // BE/E = AR+2MK+GS
Missile Technician (MT)	ELEC > 218 and MK+EI+GS > 156
Data Systems Technician (DS)	ELEC > 218 and MK+EI+GS > 156
Sonar Technician (ST)	ELEC > 218 and MK+EI+GS > 156

The assigned jobs illustrate that the demand for the highly technical jobs can be matched with the earlier definition of specialist in this thesis. The variety of the highly technical jobs show furthermore that all three types of specialists can be assigned to the category highly technical job. Table 6 displays the possible match:

[17] Data provided by the DMDC EAST, 06/30/91.

TABLE 6
RESEARCH SCOPE AND CLASSIFICATION OVERLAP

RESEARCH SCOPE
Classification Overlap

NAVY	Specialist	GROUP
Semitechnical	Others	None
Technical	Others	None
Highly Technical	Techn./Intelligence/ Administrative Spec.	Group I Group II Group III Group IV

The thesis uses four different groups of ratings for the high tech market. High tech ratings selection is based both on the Navy's classification as 'highly technical' and on the requirements for classification as a specialist. Furthermore, the cutscores associated with the ratings allow a possible transfer to other occupational fields, as shown in Table 7.

TABLE 7
HIGHLY TECHNICAL GROUPS

GROUP I

- Aviation Fire Control Technician (AQ)
- Aviation Electronics Technician (AT)
- Aviation Antisubmarine Warfare Technician (AX)
- Electronics Technician (ET)
- Electronics Warfare Technician (EW)
- Fire Control Technician (FC)
- Interior Communication Electrician (IC SUB)
- Sonar Technician (STG)

GROUP II

- Air Traffic Controller (AC)
- Aviation Electrician's Mate (AE)
- Aerographer's Mate (AG)
- Electricians's Mate (EM)
- Ocean Systems Technician (Analyst) (OTA)

GROUP III

- Gunner's Mate (GM)
- Gas Turbine Systems Technician (Electrical) (GSE)
- Gas Turbine Systems Technician (Mechanical) (GSM)
- Interior Communications Electrician (IC)

GROUP IV

- Cryptologic Technician (Interpretive) (CTI)

Table 8 shows the distribution of the selected groups as of 06/30/91:[18]

TABLE 8
DISTRIBUTION OF GROUP I TO GROUP IV

GROUP	Number of Enlisted Personnel	Percentage
Group I	58,600	12 %
Group II	34,000	6.8 %
Group III	12,536	2.5 %
Group IV	1,300	0.003 %

Based on the Department of Defense occupational classification system it must be emphasized that Group I and Group IV refer to the unofficially defined highly technical or skilled categories of Electronic Equipment Repairers and

[18] Data were provided by the DEFENSE MANPOWER DATA CENTER, East.

Communications and Intelligence Specialists. Group II and Group III contain ratings which are subsumed by the classification system as highly technical <u>and</u> technical: Other Technical and Allied Specialists and Electrician/Mechanical Equipment Repairer.[19]

[19] Occupational Conversion Manual, Enlisted/Officer/Civilian, Department of Defense, January 1987, p. X - XIII.

IV. Theoretical Model and Description of the Data

This thesis models the achievement of the minimum test score required for entry into training for highly technical Navy ratings. Developmental psychology, differential psychology, educational and vocational testing, and occupational sociology all indicate that sociodemographic characteristics such as age, gender, race, educational background, economic status, and family background influence a person's test behavior.[20] Therefore, this research used such characteristics as explanatory variables in modeling eligibility for highly technical ratings.

Three different models are estimated: the first identifies the QMAs qualified for highly technical ratings, the second estimates the probability that a person qualified for a highly technical rating is interested in the military, and the third estimates the probability that a technical qualified person enlists given his interest in the military.

The first model estimates the likelihood that respondents from a particular gender, race/ethnic market segment will qualify for highly technical ratings given their socioeconomic characteristics. The second model estimates the distribution of interest in military employment for individuals each market

[20] See also PROFILE OF AMERICAN YOUTH, 1984, ANDERSON, 1989 BISHOP, 1989, PETERSON, J., 1990.

segment given their likelihood of qualifying for highly technical ratings. The third model is based on the first two models and estimates the actual joining behavior of each market segment of the high tech market given their level of interest in the military.

To assist in applying of the results to local markets, the design of the econometric equations uses only those variables for which measures are available at the county level. As a result, the results from this thesis can be checked against historical high tech enlistments.

A. THE NLSY DATA

From 1979 to 1987 the National Longitudinal Survey of Youth (NLSY) collected data nationwide about education, training, labor force experience, financial characteristics, among others for a statistically representation sample of the U.S. population. In 1980, sponsored by the Department of Defense, the Armed Services Aptitude Battery (ASVAB) was given to both the civilian and military youth samples. The Department of Defense used the results to develop current norms for the ASVAB.

The NLSY sample consists of three groups: (1) a cross-section national sample of the American youth, aged 14 to 21 as of January 1, 1979 in their proper population proportions; (2) a sample designed to over represent civilian Hispanics, blacks, and economically disadvantaged Whites and (3) a military sample design to represent the population aged 17 -

21 as of January 1, 1979 and serving in the military as of September 30, 1978. Table 9 shows the distribution of the NLSY Respondents.[21]

TABLE 9
DISTRIBUTION OF THE NLSY SAMPLE

Cross-Section Sample 6,111		Supplemental Sample 5,295		Military Sample 1,280		TOTAL 12,686
White	4,916	White	1.643	White	951	7,510
Black	751	Black	2,172	Black	251	3,174
Hispanic	444	Hispanic	1,480	Hispanic	78	2,002

Of the original 12,686 NLSY respondents, 11,914 took the ASVAB test in 1980. Of this group, 5969 respondents were male and 5,945 respondents were female. (Also, the military sample took the ASVAB test a second time, accounting for 823 males and 457 females).[22]

B. THE THESIS DATA

Research on test performance on the AFQT and the development of estimating equations for regional QMA is not something new. HOSEK, PETERSON and EDEN (1986), PETERSON, J. (1990), and THOMAS and GORMAN (1991) use a combination of AFQT scores and sociodemographic variables to predict qualified military availables for enlistment. THOMAS and GORMAN also developed procedures for estimating the size of local civilian

[21] NLS HANDBOOK 1991, Center for Human Resource Research, The Ohio State University, Columbus, Ohio 1991, p. 29.

[22] NLS HANDBOOK 1991, p. 30.

labor markets likely to join the military. MOREAU (1991) did preliminary work on developing estimating equations for technical ratings. This thesis extends the scope of previous work by testing a procedure for developing measures of qualification, interest, and enlistment for prototypical technical military occupations.

Data were extracted from NLSY data set in order to fulfill the requirements for the 'prime market'. First, only those who were 17 to 21 years old in 1980 were included. Second, this sample was then divided into (1) white males (WM), (2) white females (WF), (3) black males (BF), (4) black females (BF), (5) Hispanic males (HM) and (6) Hispanic females (HF). This categorization into six subgroups allows comparison to previous work done by PETERSON (1990) and MOREAU (1991).

The four high tech groups of Navy occupations selected and defined in chapter III were measured for each of the six sample subgroups. The purpose was to get an impression about the distribution of the sample groups and to define the eligibility of the sample groups for the high tech ratings. Table 10 shows the results of this analysis.

TABLE 10
DISTRIBUTION FOR THE HIGHLY TECHNICAL RATINGS BY RACE AND GENDER[23]

	GROUP I	GROUP II	GROUP III	GROUP IV
WM	73.32%	97.68%	91.47%	76.22%
WF	22.50%	82.87%	54.49%	71.28%
BM	32.56%	83.72%	65.89%	41.09%
BF	3.23%	73.39%	19.35%	44.35%
HM	51.69%	95.76%	79.66%	65.24%
HF	12.16%	72.97%	35.14%	59.46%

The results show that the groups vary in their ability to qualify for the four high tech group. They also indicate that the group qualified for high tech ratings will be smaller than the prime market.

The modeling procedure was developed for the Group I high tech rating group. Three main factors led to this decision, (1) the general official acceptance as high tech by the Navy and DoD, (2) the broad rating mix in the group and (3) its wide distribution in the enlisted force.

All ratings in group I belong to occupational fields one and two of the Department of Defense occupational classification system: Electronic Equipment Repairer (AQ, AT, AX, ET, FC, IC [SUB], STG) and Communications and Intelligence Specialists (EW). These groups are regarded as "skilled categories" versus "semiskilled" and "unskilled". The general

[23] For explanation of transforming the data of the ASVAB test into the four high tech Groups please see Appendix A.

connotation of "skilled" can be used as an argument for high tech.[24]

Group I also represents a wide variety of occupational fields inside the Navy. It contains ratings from all three warfare communities and at present accounts currently for 12 percent of the enlisted force. This makes it the most populous of the four high tech groups.[25] Hence, conclusions and statements evolving out of this research cover a specific segment of the occupational fields. Expansion of the research to ratings outside group I will be left to future analysts.

C. SELECTION OF EXPLANATORY VARIABLES

The selection of the explanatory variables was based on the availability of the variables in the NLSY data set and the availability of similar variables to at a county level. Cultural, ethnical, economic, regional and educational background characteristics all influenced the eligibility of the respondents for the prime market.[26]

Previous research has shown that parents' educational attainment, and especially mother's education, influences

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[24] Eitelberg, M. ibid, 1988, p. 148 - p. 152

[25] Group I 12%, Group II 6.8%, Group III 2.5%, Group IV 0.003% as of 06/30/91. Data provided by the Defense Manpower Data Center (East).

[26] Bock, D. and Moore, E., Profile of American Youth, Office of Assistant Secretary of Defense (Manpower, Installations and Logistics), Washington, D.C. 1984, p. 184.

individual performance on the AFQT.[27] However, it has also been shown that the mother's education mainly affects certain ASVAB subtests such as Word Knowledge, Mathematics Knowledge, General Science, Arithmetic Reasoning, and Paragraph Comprehension. The effect on the other subtests is smaller.[28] Therefore, it may be more accurate to take father's and mother's education as explanatory variables. A variable called 'parents' education (PED)' was constructed. If one parent's education was missing the educational attainment of the other was used in order to maintain sample size.

The socioeconomic status of the respondents was accounted for by a variable indicating whether or not the individual's family was in poverty. The poverty variable, called 'socioeconomic status SES', was expected to influence eligibility for the prime market and hence also for the defined high tech ratings.[29]

Two special transformed variables were used to account for the possible effect of a race and poverty interaction. These interaction variables were constructed by multiplying the

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[27] PROFILE OF AMERICAN YOUTH, Office of the Assistant Secretary of Defense, Washington, D.C., 1982, p. 40.

[28] Bock and Moore, ibid, p. 191 -192.

[29] Ibid, p. 131 - 139.

poverty status variable by the race variable. The variables were called 'blses' and 'hisses'.[30]

Recent work by the Navy Personnel Research and Development Center indicates that the region in which the respondent lives influences the educational or skill level.[31] Generally, average scores on the subtests are the lowest in the South and highest in the Northeast.[32] When the fifty states were grouped into region variables called ' Northeast, Southeast, Midwest and West', a frequency analysis showed a significant difference in the distribution of eligibility for the high tech category throughout the four regions. Eligibility was highest in the Northeast and the Midwest. On the other side, eligibility was lowest in the Southeast and the West. In order to capture this effect a variable called 'South-West' was used. This variable indicates whether or not an individual resides in the Southeast or the West.

The dependent variable was a dichotomous variable indicating whether or not the respondent achieved the minimum score for the Group I high tech rating was used as example for the highly technical ratings inside the Navy. The variable name for these type of specialists was called 'hitec'.

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[30] For a complete description for the variables used out of the NLSY data set look into Appendix B.

[31] Presentation by Chipman, Mark, NPRDC, at the Naval Postgraduate School, 13 November 1991.

[32] PROFILE OF AMERICAN YOUTH, 1982, p. 42 - p. 43.

Furthermore, whether an individual lives in an urban or rural area may also affect test score. In order to examine this possible outcome a variable called 'urban' was used.

The model II dependent variable, 'interest' was based on the respondents' answer to the question regarding whether he intended to join the military. The four possible responses were "definitely try to enlist", "probably try to enlist", "probably not try to enlist", and "definitely not try to enlist". The question is, how will that respondent define his interest in the military, based on his specific eligibility for the military labor market?[33] It can be expected that the differences in the respondent's answer for 'interest' may vary with certain socioeconomic variables since general intellectual achievement tests such as ASVAB have been shown to be related to employment opportunities.[34]

The model III dependent variable, called 'join', captures an actual enlistment.[35] This variable is a construct out of the respondent's answer that he was a member of the Armed Forces as an employer from 1979 - 1987.

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[33] Gorman, L., Thomas, G.W., General Intellectual Achievement, Interest, and Racial Representativeness in the U.S. Military, unpublished manuscript, Naval Postgraduate School, Monterey, Ca., 1991.

[34] Bishop, John H., "Is the Test Score Decline Responsible for the Productivity Growth Decline?", in: The American Economic Review, vol. 79, pp. 178-197, March 1989.

[35] Thomas, G.W. and Gorman, L., ESTIMATION OF HIGH QUALITY MILITARY AVAILABLE AND INTERESTED, Draft, Naval Postgraduate School, Monterey, CA., 1991.

D. THE MODEL BUILDING

The six subgroups were examined for their eligibility for high tech under their respective economic status. The following tables show the distribution of four mental quality outcomes by the different market segments, (1) 'hitec', which only contains the people, who are eligible for the navy group I ratings, (2) the prime market <u>without</u> the hitec segment, (3) mental category 3B, and (4) those people who are not eligible for military service. Table 11 contains only the subsample who are living in poverty status.

TABLE 11
ELIGIBILITY OF THE SIX SUBGROUPS IN POVERTY BY MENTAL CATEGORIES

Subgroups in Poverty	HITEC	NOT HITEC	Category 3B	Not Eligible	Total
White Male n=201	23.2%	10.3%	19.2%	47.3%	100.0
White Fem. n=274	5.8%	22.7%	23.8%	47.7%	100.0
Black Male n=210	1.4%	2.9%	6.2%	89.5%	100.0
Black Fem. n=231	0.0%	5.2%	8.2%	86.6%	100.0
Hisp. Male n=69	4.4%	2.9%	14.5%	78.3%	100.0
Hisp. Fem. n=104	0.0%	6.7%	19.2%	74.0%	100.0

Another point of view affects the eligibility for those people who do not live in poverty. It can be assumed that the differentiations found in the six subgroups will continue.

Table 12 also shows that the differences between blacks and hispanics persists whether they live in poverty or not. The Hispanics are more likely to be eligible for the two upper mental categories, 'hitec' and 'high quality', than blacks.

Table 12 shows the same subgroups for those not living in poverty.

TABLE 12
ELIGIBILITY OF THE SIX SUBGROUPS, NOT IN POVERTY, BY MENTAL CATEGORIES

	HITEC	NOT HITEC	Category 3B	Not Eligible	Total
White Male n=1231	40.6%	14.8%	18.3%	26.3%	100.0%
White Fem. n=1337	10.4%	41.9%	23.5%	24.2%	100.0%
Black Male n=353	4.6%	11.1%	17.9%	66.5%	100.0%
Black Fem. n=365	0.6%	15.6%	23.6%	60.3%	100.0%
Hisp. Male n=285	16.3%	11.7%	17.3%	54.8%	100.0%
Hisp. Fem. n=221	1.4%	13.2%	17.3%	68.2%	100.0%

The Hispanics are more likely to be qualified for 'hitec' than blacks. Although, no black and hispanic females out of the sample are eligible for 'hitec', hispanic males are nearly three times more likely to be eligible for the 'hitec' category than black males. The trend continues for the 'high quality' category.

All in all, it can be concluded that living in poverty makes it less likely to be eligible for the high tech / high quality market. It seems also that minorities are more affected by poverty.

1. Model Specification

The logit model assumes a dependent random variable with mutually exclusive and exhaustive outcomes. The dependent Variable can be binary or multinomial. For a given observation on X_i, the probability that a response will be in category j is given by the equation[36]

$$P_{ji} \equiv P\ (Y= j|X_i) = \exp[b'_j X_i]\ /\ D_i$$

where $$D_i = \Sigma[\exp(b'_j X_i)].$$

The dependent variable is measured as the number of individuals eligible for a defined mental category.

The logit model contains several important features: (1) as X_i increase so does the probability P_{ji} within the zero and one interval, and (2) the relationship between the estimated probability P_i and the explanatory variables X_i is nonlinear.[37]

[36] Aldrich, J.H., Nelson, F.D., Linear Probability, Logit, and Probit Models, New York, New York 1990, p. 73.

[37] Gujarati, D., ibid, p. 500.

V. MODELS ESTIMATION

A. MODEL I ESTIMATION OF MENTAL CATEGORIES

Model I estimates the likelihood of reaching the minimum high tech composite score for the four mental outcomes (1) not eligible for the military labor market, (2) mental category 3B, (3) High Quality/Not High Tech and (4) High Tech. The sample distribution for these categories for the six gender, race/ethnic groups is given in Table 13:

TABLE 13.
SAMPLE DISTRIBUTION OF THE FOUR MENTAL CATEGORIES

Mental Category	WM	WF	BM	BF	HM	HF
(4) HITECH	37.2%	9.4%	3.2%	0.3%	13.5%	0.8%
(3) HQ/Not HITECH	14.1%	38.1%	8.1%	10.8%	10.1%	9.9%
(2) 3 B	18.7%	23.2%	13.0%	17.3%	16.2%	17.7%
(1) NOT ELIGIBLE	30.0%	29.3%	75.7%	71.6%	60.2%	71.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
n	1516	1712	602	637	364	363

The distribution of the four mental categories indicate that the qualification for High Tech differs widely among the market segments. White males (37.2%) are nearly three times more qualified for the High Tech category than hispanic males (13.5%). Black males are with 3.2% less qualified than hispanic males.

Females in general are less qualified for High Tech than the males. Again, white females (9.4%) are more qualified than hispanic females (0.8%) and black females (0.3%). However, white and black females are with 38.1% and 10.8%, respectively, more qualified for the selected mental outcome High Quality/Not High Tech than their male peers. The Hispanic women are with 9.9% slightly less qualified than hispanic males (10.1%).

Table 13 also indicates that percentage of the black and hispanic market segments not eligible for military service, are about twice as large as that of the white market segments. Over 70 percent of the blacks and nearly 65 percent of the hispanics are not eligible for the military versus 30 percent of the white market segments. One would expect these sample distribution would be reflected in the econometric model building.

Separate models were estimated by gender using race/ethnic categories as shift parameters. The LOGIST procedure of version 6.06 SAS was used to estimate the multinomial equations. A priori, it can be expected that being black or hispanic racial variables would increase the likelihood of being not eligible for military enlistment for males and females. Furthermore, the socioeconomic status and the interaction variables of race with socioeconomic status (0=not poverty, 1=poverty), BLSES and HISSES, were expected to increase the probability of being ineligible for military enlistment.

Tables 14 and 15 give the estimated multinomial logit coefficients by gender for four different mental categories as function of race, socioeconomic status, parents' education and region.

Table 14: Estimated Coefficients
for Model I Males

Variable	Parameter Estimate	Pr > Chi-square
Intercept 1	0.88 (0.36)	0.02
Intercept 2	1.82 (0.38)	0.01
Intercept 3	2.55 (0.38)	0.01
Black	1.72 (0.13)	0.01
Hispanic	0.72 (0.14)	0.01
Ses	0.65 (0.15)	0.01
Ped	-0.04 (0.06)	0.55
Ped2	-0.01 (0.00)	0.01
South-West	0.41 (0.11)	0.01
Urban	-0.31 (0.11)	0.01
BLSES	0.49 (0.30)	0.10
HISSES	0.12 (0.36)	0.74

(Standard errors in parentheses)

Table 15: Estimated Coefficients
for Model I Females

Variable	Parameter Estimate	Pr > Chi-square
Intercept 1	0.90 (0.42)	0.03
Intercept 2	2.12 (0.42)	0.01
Intercept 3	4.65 (0.42)	0.01
Black	1.57 (0.12)	0.01
Hispanic	1.29 (0.17)	0.01
Ses	0.56 (0.13)	0.01
Ped	-0.10 (0.06)	0.13
Ped2	-0.01 (0.00)	0.02
South-West	0.79 (0.09)	0.01
Urban	-0.09 (0.10)	0.34
BLSES	0.39 (0.26)	0.13
HISSES	-0.65 (0.31)	0.04

(Standard errors in parentheses)

The estimated coefficients show mental category distribution is significantly affected by race, socioeconomic status, parents' education and geographic location. These variables are all statistically significant in both the male and female models. The model results for the blacks, whether male or female, indicate that their likelihood of qualifying for High Tech or High Quality is less that of hispanics and whites. Blacks in poverty have even lower estimated scores. The significance levels for the parents' education, and the interaction variables 'BLSES' and 'HISSES' indicate that the individual effects of these variables are not significant. The variable 'Urban' was not significant in the female model. However, both models show that living in the South-West states has a positive and significant effect on the estimated parameters.

The associated Log Likelihood statistics indicate that the variables as a group provide statistically significant explanation of mental category grouping. For males, -2 Log Likelihood = 5854.9 yielding a chi-square of 845.1 with 9 df (p=0.001). For Females, -2 Log Likelihood = 6183.8 yielding a chi-square of 1013.9 with 9 df (p=0.001).

Somer's D statistic is a measure of predictive ability which is an index of rank correlation between predicted probabilities and observed outcomes.[37] Somer's D statistic

[37] SAS/STAT User's Guide, Version 6, Fourth Edition, Volume 1, Cary, N.C., 1990, p. 867 - p. 868.

for the male model (.52) and for the female model (.55) indicate good model fit. Another goodness of fit index is the C statistic which measures the model's predictive ability based on whether an observation with a specific mental outcome would be predicted to score in that same specific mental outcome. The C statistics indicate good model fit with .76 for the male and .78 for the female model.[38]

To check the models for within sample consistency the estimated mental category distributions calculated for the six market subgroups are presented in Table 16[39]. The probabilities were calculated using model I results from Table 14 and Table 15. The means of parents education for the three races used for this calculation were White=12.4 yrs, Black=11.2 yrs, Hispanic=8.4 yrs. Table 16 illustrates that the chances of being eligible for the two upper mental categories, high tech and high quality/not high tech, are good for white males. The pattern in Table 16 matches quite well the sample gender/race mental category distributions in Table 13.

[38] ibid, Volume 2, p. 1090 - p. 1091.

[39] The procedure used is described in: SAS/STAT USER'S GUIDE, Version 6, Fourth Edition, Volume 2, Cary, NC, 1990, p. 1087.

TABLE 16
ESTIMATED GENDER/RACE MENTAL CATEGORY DISTRIBUTIONS BY POVERTY STATUS (POVERTY IN PARENTHESES)

Mental Category	WM	WF	BM	BF	HM	HF
HIGH TECH	.30 (.18)	.08 (.05)	.17 (.10)	.01 (.01)	.15 (.08)	.02 (.01)
HQ not Hitec	.17 (.13)	.43 (.33)	.11 (.08)	.10 (.06)	.10 (.07)	.17 (.10)
3 B	.22 (.23)	.27 (.29)	.23 (.18)	.17 (.12)	.22 (.40)	.39 (.19)
Not Eligible	.31 (.46)	.22 (.33)	.49 (.64)	.72 (.81)	.53 (.45)	.42 (.70)
Total	**100.0 (100.0)**	**100.0 (100.0)**	**100.0 (100.0)**	**100.0 (100.0)**	**100.0 (100.0)**	**100.0 (100.0)**

Almost one third (.30) of white males not in poverty qualify for the high tech category. White females (.08) are much less eligible for high tech occupations than white males. However, with 51% (0.8 +.43) in the high quality market, white females are a promising group to recruit for the high quality category, if they are not in poverty. Minority females are much less eligible than white females for military enlistment. Poverty decreases the eligibility of all market segments, particularly hispanic females.

Black (.17, .11) and hispanic (.15, .10) males are nearly equally eligible for the two upper mental outcomes, whether they are in poverty or not. However, more than half of the minorities are not eligible for the military. The corresponding value for whites is less than one third.

In summary, model I shows that the labor market for recruiting High Tech and/or High Quality personnel is not determined only by racial and gender specific effects. The socioeconomic status and the educational background of the parents also influence eligibility for the selected mental categories. Minorities in poverty, although available in high numbers on the prime market, are less likely to be recruited for high tech occupations. Applicants from South-West region are also less likely to be eligible than their peers out of the other states.

B. MODEL II 'INTEREST' AND HIGH TECH MENTAL CATEGORIES

The second model examines the relationship between four mental categories and interest. It is expected that interest in the military decreases as mental test scores increase. Interest was measured by responses to the NLSY question "Do you think, in the future, that you will (1) definitely try to enlist, (2) probably try to enlist, (3) probably not try to enlist, and (4) definitely not try to enlist."[40] The subset of the NLSY data set used for the interest equation estimation omitted respondents who were in the military when they responded to the interest question.

Model II estimates the interest in military employment for each market segment given their likelihood of being qualified for highly technical ratings. The dependent multinomial

[40] Respective answers were (1) 2.9%, (2) 15.8%, (3) 34.3%, and (4) 46.9% for the 5167 respondents in the sample of civilians.

variable is interest; explanatory variables are the four mental categories and the socioeconomic variables of model I.

A contingency table analysis for the six market segments for the distribution of the interest with the four mental categories was conducted for the sample. Tables 17 and 18 show the relationship between interest and mental categories or white and black males.

TABLE 17
DISTRIBUTION OF 'INTEREST' AND THE FOUR MENTAL CATEGORIES, WHITE MALES

Interest	HITEC	Not HITEC	3 B	Not Eligible
Def. Yes	0.7%	3.3%	2.2%	5.9%
Prob. Yes	11.0%	14.1%	17.9%	25.3%
Prob. No	49.1%	50.2%	39.6%	31.0%
Def. No	39.2%	32.4%	40.3%	37.8%
Total Columns	100.0% n=544	100.0% n=213	100.0% n=268	100.0% n=455

TABLE 18
DISTRIBUTION OF 'INTEREST' AND THE FOUR MENTAL CATEGORIES, BLACK MALES

Interest	HITEC	Not HITEC	3 B	Not Eligible
Def. Yes	0.0%	3.6%	4.6%	12.3%
Prob.Yes	20.8%	12.5%	14.9%	34.1%
Prob. No	45.8%	35.7%	31.0%	22.1%
Def. No	33.4%	48.2%	49.5%	31.5%
Total Columns	100.0% n=24	100.0% n=56	100.0% n=87	100.0% n=457

The tables show that white males generally are less interested in enlistment than black males given their mental category. These two tables are examples of the significant differences in the interest distribution for the six subgroups and in their distribution over the four mental categories.

Model I already suggested that a reverse relationship exists in the eligibility for the mental categories: white males are more qualified than black males for the highly technical ratings. The last two tables, showing the interest distribution, indicate that although more qualified, white males are in general less interested.

A multinomial logistic regression was conducted for interest in the military. Two separate models were estimated by *gender* using again race/ethnic categories as shift parameters.

Tables 19 and 20 give the estimated coefficients for the four different interest categories as a function of the four mental outcomes and the socioeconomic variables of model I.

TABLE 19
ESTIMATED COEFFICIENTS FOR MODEL II MALES

Variables	Parameter Estimate	Pr > Chi-square
intercept 1	-2.94(0.32)	0.01
intercept 2	-0.76(0.31)	0.01
intercept 3	0.97(0.31)	0.01
Hitec	-0.50(0.12)	0.01
High Quality	-0.35(0.14)	0.01
3B	-0.50(0.12)	0.01
Black	-0.02(0.13)	0.88
Hispanic	0.18(0.14)	0.21
Ses	0.05(0.15)	0.76
Ped	-0.01(0.05)	0.92
Ped2	-0.01(0.00)	0.64
South-West	0.60(0.10)	0.01
Urban	-0.03(0.10)	0.75
BLSES	1.12(0.23)	0.01
HISSES	0.63(0.30)	0.04

(Standard errors in parentheses)

TABLE 20
ESTIMATED COEFFICIENTS FOR MODEL II FEMALES

Variables	Parameter Estimate	Pr > Chi-square
intercept 1	-4.68(0.36)	0.01
intercept 2	-2.36(0.32)	0.01
intercept 3	0.64(0.32)	0.04
Hitec	-0.08(0.19)	0.68
High Quality	-0.01(0.11)	0.91
3B	-0.37(0.11)	0.01
Black	-0.55(0.12)	0.01
Hispanic	0.61(0.16)	0.01
Ses	0.13(0.14)	0.36
Ped	-0.07(0.06)	0.18
Ped2	-0.01(0.00)	0.23
South-West	0.26(0.09)	0.01
Urban	-0.20(0.10)	0.04
BLSES	1.03(0.27)	0.45
HISSES	0.20(0.27)	0.45

(Standard errors in parentheses)

The estimated coefficients in Tables 19 and 20 show substantial differences in significance of the explanatory variables between the male and female models. A gender difference can be seen in the significance level for the Hitec and High Quality coefficients. Only the male model shows statistically significant coefficients for these mental categories. This result is similar to GORMAN and THOMAS' (1991) findings about general intellectual achievement for males. However, their work is limited to males. This thesis indicates that gender specific differences exist, which may be due to constraints on labor market opportunities for women. Further exploration of these differences is beyond the scope of this thesis.

Another interesting difference between the male and female models is that the race variables for blacks and hispanics are only significant for the female model. As GORMAN and THOMAS (1991) found that a black dummy variable was not a significant explanatory variable for interest in their general intellectual achievement paper, these results clearly emphasize the importance of interest relationships using gender separated models.

The estimated coefficients for poverty and parents education are not significant. The interaction variables 'BLSES' and 'HISSES' are only significant in the male model. Like the results in model I, the interest model also supports the assumption that living in the 'South-West' has a significant negative effect on interest in the military.

The associated Log Likelihood statistics indicate that the variables as a group provide statistically significant explanation to interest category grouping. For males -2 Log Likelihood = 5217.4 yielding a chi-square of 198.6 with 12 df (p=0.001). For females -2 Log Likelihood = 4822.4 yielding a chi-square of 67.5 with 12 df (p=0.001).

Somer's D statistic for the male model (.24) and for the female model (.16) indicate a poorer fit than model I. The C statistics for the interest model are .62 for the male model and .58 for the female model.

To check the model for within sample consistency the estimated interest distributions calculated for the male and female market subgroups are presented in Table 21. Opposite to model I, the calculated interest probabilities indicate that poverty status has very little influence on the distribution of the relative level of interest given one's the eligibility for a specific mental outcome. This result agrees with prior findings by Gorman and Thomas (1991), who suggested that interest mainly depends on general intellectual achievement,and argued that general intellectual achievement was a good proxy for civilian sector employment opportunities. Table 21 shows the estimated interest distribution by race and by mental categories:

TABLE 21
ESTIMATED RACE INTEREST LEVEL DISTRIBUTION OR MALES BY MENTAL CATEGORIES (IN POVERTY IN PARENTHESES)

	Interest: Def. Yes	Interest: Prob. Yes	Interest: Prob. No	Interest: Def. No	Total
HITEC					
WM	.03 (.03)	.16 (.16)	.37 (.39)	.44 (.42)	100%
BM	.07 (.08)	.34 (.35)	.38 (.38)	.20 (.19)	
HM	.06 (.06)	.30 (.32)	.40 (.39)	.24 (.23)	
HQ not Hitec					
WM	.03 (.03)	.18 (.19)	.39 (.39)	.40 (.39)	100%
BM	.08 (.08)	.37 (.37)	.37 (.36)	.18 (.18)	
HM	.07 (.07)	.33 (.34)	.39 (.39)	.21 (.20)	
3 B					
WM	.03 (.03)	.16 (.16)	.37 (.39)	.44 (.42)	100%
BM	.07 (.08)	.34 (.35)	.38 (.38)	.20 (.19)	
HM	.06 (.06)	.30 (.32)	.40 (.39)	.24 (.23)	
Not Eligible					
WM	.04 (.04)	.23 (.25)	.41 (.40)	.32 (.31)	100%
BM	.12 (.12)	.42 (.43)	.32 (.32)	.14 (.13)	
HM	.10 (.10)	.38 (.40)	.47 (.30)	.05 (.20)	

The interpretation of the estimates indicates different relative levels of interest for whites, blacks and hispanics based on their mental eligibility.

Black and hispanic males, although not eligible for military service, are more interested in the military with 54% (.12 + .42) and 48% (.10 + .38)in the two highest interest categories. White males are with 27% (.04 + .23) less interested in military employment than the blacks and

TABLES 22
ESTIMATED RACE INTEREST LEVEL DISTRIBUTION
FOR FEMALES BY MENTAL CATEGORIES
(IN POVERTY IN PARENTHESES)

	Interest: Def. Yes	Interest: Prob. Yes	Interest: Prob. No	Interest: Def. No	Total
<u>HITEC</u>					
WM	0.0 (.01)	.09 (.09)	.27 (.29)	.64 (.61)	100%
BM	.02 (.02)	.12 (.14)	.34 (.35)	.52 (.49)	
HM	.02 (.02)	.16 (.18)	.36 (.40)	.46 (.34)	
<u>HQ not Hitec</u>					
WM	.01 (.01)	.11 (.13)	.33 (.34)	.55 (.52)	100%
BM	.02 (.03)	.17 (.18)	.40 (.39)	.41 (.40)	
HM	.03 (.03)	.21 (.23)	.41 (.40)	.35 (.34)	
<u>3 B</u>					
WM	.01 (.01)	.11 (.12)	.32 (.33)	.56 (.54)	100%
BM	.02 (.02)	.16 (.18)	.37 (.38)	.45 (.42)	
HM	.03 (.03)	.19 (.22)	.40 (.40)	.38 (.35)	
<u>Not Eligible</u>					
WM	.01 (.02)	.12 (.12)	.32 (.34)	.55 (.52)	100%
BM	.02 (.03)	.17 (.18)	.38 (.39)	.43 (.40)	
HM	.03 (.03)	.21 (.23)	.39 (.40)	.47 (.34)	

hispanics. In other words: market segments, although not eligible, have a strong desire in military employment.

But, how interested are the male market segments, which can actually qualify for high tech? White males, who can qualify for high tech, express a positive interest in the military by 19% (.03 + .16). Black (.41 =.07 + .34) and Hispanic (.36 =.06 + .30) males are more than twice as much interested in the military than are white males. None of the male market segments that are high tech qualified are very interested in the military. Most likely their labor market alternatives are so good that they consequently have little interest in the military. This confirms the role that mental eligibility plays on the relative level of interest as discussed in GORMAN and Thomas (1991).

Based on the calculated estimates, female market segments seem substantially less interested in the military than males. For the female market segments an average of 12% for whites, 17% for blacks, and 21% for Hispanics seem to be positively interested in military throughout all mental categories. The numbers also indicate that their relative level of interest is relatively stable throughout all four mental outcomes. In other words: The level of female interest does not depend on a mental categories. This result may indicate simply that women do not regard the military employment as a natural labor market alternative. In summary, model II indicates that the level of interest is influenced by mental eligibility and a subset of socioeconomic variables such as race, poverty status, and geographic location.

C. MODEL III JOINING THE MILITARY AND INTEREST

The third model estimates the actual enlistment behavior of the male market segments of the high tech market given their level of interest in the military. A decision was made to examine only the male proportion of the sample because previous results from models I and II indicate gender specific differences, and because of a limited female sample.

The dependent binomial variable 'join' was constructed from the respondent's answer that he had the Armed Force as an employer. Explanatory variables included the interest categories, a dichotomous variable for High tech or High Quality (1=High Tech, 0=High Quality, but not High Tech), race/ethnic variables and the geographical variable 'South-West' of the previous models. The four level variable 'interest' was combined to two outcomes (positive or negative). Responses of "definitely yes" and "probably yes" were coded as 'INT=1' and "probably not " and "definitely not" were transformed to 'INT=0'.

Out of the sample size of 895 high quality males, 65 males (7.3%) actually joined the military. The predictive ability of model III may be substantially influenced by the small number joining the military.

Table 23 Estimated Coefficients for Model III Males

Variable	Parameter Estimate	Pr > Chi-square
Intercept	3.63 (0.33)	0.01
High Tech	-0.37 (0.32)	0.25
Black	-1.39 (0.41)	0.01
Hispanic	1.98 (1.03)	0.06
South-West	-0.96 (0.33)	0.01
Interest	-2.12 (0.29)	0.01

(Standard errors in parentheses)

Nevertheless, the purpose of constructing a prototypical 'Join'-model can still be accomplished. Table 23 shows the results of the binary logistic regression.

The estimated coefficients are in line with the results from the previous models. The decision to join is significantly affected by race, region and interest. The greater the expressed disinterest of the people, the greater is the likelihood of not joining the military. After controlling for interest the likelihood for high quality blacks to join the military is smaller than for the Hispanics or whites. The region variable 'South-West' increases the negative effect. Furthermore, as expected, the people who are eligible for the highly technical navy ratings, although not significant when controlling for interest, are less likely to join the military than other high quality potential recruits.

Model III has a -2 Log Likelihood of 466.1, yielding a chi square of 80.1 with 5 df (p=0.001), indicating that the variables as a group are statistically significant for explaining joining behavior. The C statistic indicates good model fit with a value of .75. The model shows a rate of 85.7% predictive ability of the outcome that an individual is likely to join the military.

In summary, model III shows that a prototypical equation for estimating join behavior can be accomplished. The model indicates that the decision to join is strongly influenced by the relative level of interest, race and geographic location.

The influence of high tech eligibility on joining appears to work through its effect on the level of interest.

VI. SUMMARY AND CONCLUSIONS

The thesis provides an operating definition for 'High Tech' Navy occupations and estimates three prototypical models for high tech Navy ratings. Model I estimates the likelihood of being qualified for highly technical ratings given gender, race, parents education, poverty status, and geographic location. Model II estimates the likelihood of the highly technical being interested in the military given technical rating qualification, gender, race, parents education, poverty status and geographic location. Model III estimates the likelihood of enlisting in the military for males given technical rating qualification, a level of interest, race, and geographic location.

Model I indicates that the labor market for recruiting High Tech and/or High Quality personnel is not determined only by racial and gender specific effects. The socioeconomic status and the educational background of the parents influence the eligibility for the selected mental categories. Minorities in poverty, although available in high numbers on the prime market, are less likely to be recruited for high tech occupations. Applicants from the South or West are also less likely to be eligible than their peers from the other states.

Model II agrees with previous work in that the level of interest plays a significant role. It could be shown that interest and mental eligibility are based on a subset of socioeconomic variables. Race, gender, poverty status and geographical location accounted for a large fraction of the difference in interest and eligibility.

Model III shows that a prototypical equation for estimating join behavior can be accomplished. Furthermore, the model predicts that the decision to join is influenced by the relative level of interest, race and geographic location. It appears that the high tech mental eligibility on joining is influenced by the level of interest.

All three estimated models fit quite well. The results of the three equations indicate that (1) high tech eligibility can be measured and estimated, (2) that race, gender and socioeconomic variables influence significantly the level of mental eligibility, (3) that interest in the military can be estimated as a function of mental eligibility, race, gender and a subset of socioeconomic variables, (4) that intention to join can be modeled as a function of mental eligibility, a given level of interest and a subset of socioeconomic variables. These models can form a basis for estimating regional rotation in the relative size of 'high tech' markets.

One result of model I and II suggests further exploration of the gender specific differences in high tech qualification and interest. Significant different employment opportunities for women exist and the military is still a very non-traditional employment alternative for many women.

Future research should focus on further development and verification of the introduced prototypical models for the high tech market. As they stand, the prototypical models offer an application for individual level models for estimating regional market segments. The prototypical equations developed in this thesis are a good beginning for such market applications.

APPENDIX A

CONVERSION OF RAW ASVAB DATA TO STANDARDIZED SCORES[1]

ASVAB standardized scores are computed through a conversion process using a linear transformation using a mean of 50 and a standard deviation of 10. The formula to transform a raw subtest score into a standard subtest score (SSS) is as follows:

$$SSS = (10/S)\ (NC-X) + 50,$$

where

SSS = the standardized subtest score (round this result to the nearest integer: if it is less than 20 raise it to 20 and if it is greater than 80 then lower it to 80)

S = the standard deviation of the subtest raw scores[2]

NC = the number of questions answered correctly for the given subtest (for Verbal this is the sum of the number answered correctly for Word Knowledge and Paragraph Comprehension)

X = the mean of the subtest raw scores[3]

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[1] See also Peterson, Jeff, ibid, 1990.

[2] Moreau, Ellen, ibid, 1991.

[3] Moreau, Ellen, ibid, 1991.

APPENDIX B

TABLE B-1 YOUTH NATIONAL LONGITUDINAL SURVEY (NLSY) VARIABLES USED IN DATA ANALYSIS

Variable Number	Variables Description and Survey Year
R 65	Highest Grade Attended by Mother (1979)
R 79	Highest Grade Attended by Father (1979)
R 96	Racial/Ethnic Origin (1979)
R 2148	Sex of Respondents (1979)
R 2149	Employment Status Record (1979)
R 2202	Age of Respondent (1980)
R 2357	Interest in Military Enlistment (1980)
R 3935.10	Is R''S Residence Urban/Rural (1980)
R 4063	Employment Status Record (1980)
R 6150	ASVAB Subtest Raw Score; General Science (1980)
R 6151	ASVAB Subtest Raw Score; Arithmetic Reasoning (1980)
R 6152	ASVAB Subtest Raw Score; Word Knowledge (1980)
R 6153	ASVAB Subtest Raw Score; Paragraph Comprehension (1980)
R 6154	ASVAB Subtest Raw Score; Numerical Operations (1980)
R 6155	ASVAB Subtest Raw Score; Coding Speed (1980)
R 6156	ASVAB Subtest Raw Score; Auto and Shop Information (1980)
R 6157	ASVAB Subtest Raw Score; Mathematics Knowledge (1980)
R 6158	ASVAB Subtest Raw Score; Mechanical Comprehension (1980)
R 6159	ASVAB Subtest Raw Score; Electronics Information (1980)
R 6185	Family Poverty Status
R 6457	Employment Status Record (1981)
R 8977	Employment Status Record (1982)
R 11463	Employment Status Record (1983)
R 15215	Employment Status Record (1984)
R 18922	Employment Status Record (1985)
R 22593	Employment Status Record (1986)
R 24467	Employment Status Record (1987)

APPENDIX C

ABBREVIATIONS OF ASVAB CLASSIFICATION COMPOSITES

ARMY	EL=ELECTRONICS,OF=OPERATORS/FOOD,SC=SURVEILLANCE MM=MECHANICAL MAINTENANCE,CL=CLERICAL,ST=SKILLED TECHNICAL,CO=COMBAT,FA=FIELD ARTILLERY, GM=GENERAL MAINTENANCE
MARINE CORPS	CO=COMBAT,FA=FIELD ARTILLERY,CL=CLERICAL EL=ELECTRONICS REPAIR,MM=MECHANICAL MAINTENANCE, GT=GENERAL TECHNICAL
NAVY	GT=GENERAL TECHNICAL,MECH=MECHANICAL,ELEC=ELECTRONICS,CLER=CLERICAL,AM=AVIATION STRUCTURAL MECHANICAL,BE/E=BASIC ELECTRICITY/ELECTRONICS BT/EN/MM=BOILER TECHNICIAN/ENGINEMAN/MACHINISTS MATE,MR=MACHINERY REPAIRMAN,SUB=SUBMARINE,CT= COMMUNICATIONS TECHNICIAN,HM=HOSPITALMAN
AIR FORCE	M=MECHANICAL, A=ADMINISTRATIVE, G=GENERAL, E=ELECTRONICS

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